

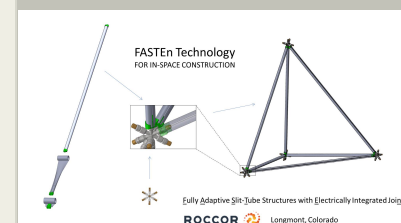
Fully Adaptive Slit-tube Structures with Electrically Integrated Smart Joints, Phase I

Completed Technology Project (2017 - 2017)



Project Introduction

In response to NASA's need for compact, low-cost in-space modular construction components, Roccor proposes to develop structural elements designed for rapid in-space assembly and structural adaptation. The proposed invention, FASTEn (Fully Adaptive Slit-Tube structures with Electrically integrated smart joints), utilizes deployable composite slit-tubes in conjunction with electrically integrated structural joint connectors for simple in-space assembly of truss-like constructions. The proposed design will advance autonomous in-space assembly opportunities through innovative features such as: 1) implementing coilable slit-tubes in structural arrangements at low-weight, low-cost and minimal stowage volume 2) developing rigid plug-and-play joints for connecting slit-tubes in modular arrangements, 3) integrating conductive elements for a fully connected structure with joint connection verification, 4) near zero thermal expansion in carbon fiber composite slit-tubes. The principal objective for the Phase I project is to conduct a preliminary design-analysis-fabrication-test loop for an electrically integrated modular slit-tube boom (STB) truss assembly. The project will clearly identify engineering risks that must be addressed to ultimately ensure adequate performance on-orbit and in gravity loaded environments. Detailed mechanical and electrical design will be performed including investigation of attainable truss geometries, repeatable plug-and-play joint fastening mechanisms, material selection and conductive routing. The design efforts will be followed by local and global strength, stability and thermal analyses to describe the capacity of slit-tubes in truss arrangements and strength of the connective truss joints. Furthermore, elements of the concept will be prototyped to test areas such as modular assembly and electrical continuity across slit-tubes and joints.



Fully Adaptive Slit-tube Structures with Electrically Integrated Smart Joints, Phase I Briefing Chart Image

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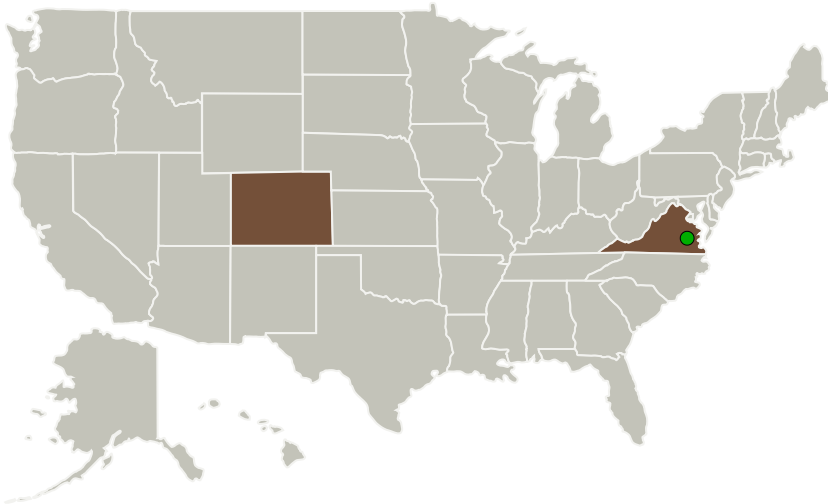
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Roccor, LLC	Lead Organization	Industry	Longmont, Colorado
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Colorado	Virginia
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Roccor, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

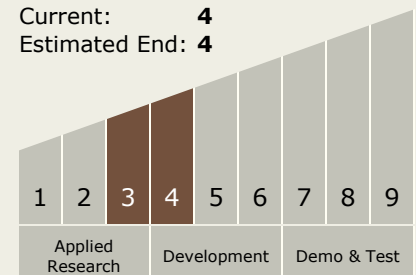
Carlos Torrez

Principal Investigator:

Dana Turse

Technology Maturity (TRL)

Start: 3
 Current: 4
 Estimated End: 4

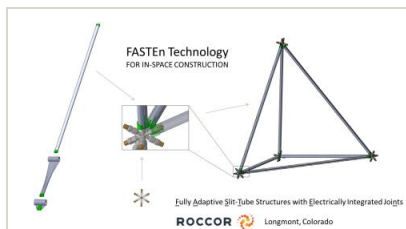


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Images



Briefing Chart Image

Fully Adaptive Slit-tube Structures with Electrically Integrated Smart Joints, Phase I Briefing Chart Image

(<https://techport.nasa.gov/image/129257>)

Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.2 Mission Infrastructure, Sustainability, and Supportability
 - └ TX07.2.4 Micro-Gravity Construction and Assembly

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System